

We claim:

1. An optical coupler for coupling an optoelectronic device to an optical fiber and a microelectronic device, comprising:

5 a microelectronic device;  
an optical transmission medium disposed proximate the microelectronic device; and  
an encapsulant surrounding at least a portion of the microelectronic device and at least a portion of the transmission medium.

10 2. The optical coupler of claim 1, further comprising a first electrical connector coupled to the microelectronic device.

15 3. The optical coupler of claim 2, wherein the first electrical connector comprises a lead portion of a leadframe.

20 4. The optical coupler of claim 2, further comprising a wirebond connected to the microelectronic device and the first electrical connector.

5. The optical coupler of claim 2, further comprising a conductive bump connected to the microelectronic device and the first electrical connector.

25 6. The optical coupler of claim 2, further comprising a second electrical connector coupled to the microelectronic device.

7. The optical coupler of claim 6, further comprising a wirebond connected to the microelectronic device and the second electrical connector.

30 8. The optical coupler of claim 6, wherein the second electrical connector comprises a lead portion of a leadframe.

9. The optical coupler of claim 6, wherein the second electrical connector comprises a conductive bump.

10. The optical coupler of claim 1, wherein the optical transmission medium comprises a material selected from the group consisting of a glass block, a fiber ribbon, a fiber tape, a holographic optical element, and a bundle of fused glass fibers.

11. The optical coupler of claim 1, wherein the optical transmission medium comprises bundle of fused glass fibers.

12. The optical coupler of claim 11, wherein the each of the fused fibers has a core diameter smaller than about 50 microns.

13. The optical coupler of claim 1, wherein the encapsulant comprises silica-filled epoxy material.

14. The optical coupler of claim 1, further comprising guide grooves configured to receive guide pins attached to a fiber ribbon.

15. The optical coupler of claim 1, further comprising a base plate configured to receive the microelectronic device.

16. The optical coupler of claim 1, further comprising die attachment material to facilitate bonding of the connector to a substrate.

17. The optical coupler of claim 1, further comprising conductive tape configured to facilitate coupling the connector to an optoelectronic device.

18. The optical coupler of claim 1, wherein the microelectronic device comprises a driver for a light emitting device.

19. The optical coupler of claim 1, wherein the microelectronic device comprises an amplifier for a light detecting device.

20. The optical coupler of claim 1, wherein the microelectronic device comprises a driver for a light emitting device and an amplifier for a light detecting device.

21. An optical interconnect system comprising the optical coupler of claim 1.

22. An optical coupler comprising:

a microelectronic device;

an encapsulant surrounding at least a portion of the microelectronic device; and

at least one guide groove formed in the encapsulant, the at least one guide groove configured to receive a pin from a connector attached to a fiber ribbon.

23. The optical coupler of claim 22, further comprising a light transmission path formed within the encapsulant.

24. The optical coupler of claim 23, wherein the light transmission path comprises a material selected from the group consisting of a glass block, a fiber ribbon, a fiber tape, a holographic optical element, and a bundle of fused glass fibers.

25. The optical coupler of claim 24, wherein the light transmission path comprises a bundle of fused glass fibers.

26. The optical coupler of claim 22, further comprising electrical connectors configured to couple the microelectronic device to an optoelectronic device.

27. The optical coupler of claim 26, wherein the electrical connectors comprise a portion of a leadframe.

28. The optical coupler of claim 26, wherein the electrical connectors comprise a conductive bump.

29. The optical coupler of claim 22, further comprising electrical connectors  
5 configured to couple the microelectronic device to a substrate.

30. The optical coupler of claim 29, wherein the electrical connectors comprise a portion of a leadframe.

10 31. The optical coupler of claim 29, wherein the electrical connectors comprise a conductive bump.

32. The optical coupler of claim 22, wherein at least a portion of the encapsulant comprises a transfer mold compound.

33. The optical coupler of claim 22, wherein the microelectronic device comprises a driver for a light emitting device.

34. The optical coupler of claim 22, wherein the microelectronic device comprises an  
20 amplifier for a light detecting device.

35. The optical coupler of claim 22, wherein the microelectronic device comprises a driver for a light emitting device and an amplifier for a light detecting device.

25 36. A method of forming an optical coupler, the method comprising the steps of:  
creating electrical connectors;  
attaching a microelectronic device to the electrical connectors; and  
encapsulating at least a portion of the electrical connectors and at least a portion  
of the microelectronic device.

37. The method of forming an optical coupler of claim 36, further comprising the step of forming guides.

38. The method of forming an optical coupler of claim 37, wherein the step of forming guides comprises bending a portion of a conductive plate to form a conduit.

39. The method of forming an optical coupler of claim 36, wherein the step of creating electrical connectors comprises providing a leadframe and bending the leads of the leadframe.

40. The method of forming an optical coupler of claim 36, wherein the step of creating electrical connectors comprises patterning a surface of a plate of conductive material, etching the plate of conductive material to form conductive leads, and bending the conductive leads.

41. The method of forming an optical coupler of claim 36, further comprising the step of forming a transmission path.

42. The method of forming an optical coupler of claim 36, further comprising the step of polishing an end of the transmission path.

43. The method of forming an optical coupler of claim 36, further comprising the step of singulating.

44. The method of forming an optical coupler of claim 36, further comprising the step of coating an end of the electrical connectors with a conductive material.

45. The method of forming an optical coupler of claim 44, wherein the step of coating an end comprises attaching a conductive tape to an end.

46. The method of forming an optical coupler of claim 44, wherein the step of coating an end comprises plating conductive material on the end.

47. The method of forming an optical coupler of claim 36, further comprising the step of attaching guide sleeves to a portion of the electrical connectors.

48. The method of forming an optical coupler of claim 36, further comprising the step of forming a ground plane coupled to a portion of the electrical connectors.

49. The method of forming an optical coupler of claim 36, wherein the step of creating electrical connectors comprises forming the electrical connectors from a sheet of conductive material; the method further comprising the step of providing a stiffener to a bottom portion of the sheet of conductive material.

50. The method of forming an optical coupler of claim 49, further comprising the step of removing the stiffener.

51. The method of forming an optical coupler of claim 36, further comprising the step of forming pedestals on a portion of the electrical connectors, the pedestals configured to facilitate bonding of the connectors to a microelectronic device.

52. The method of forming an optical coupler of claim 51, wherein the pedestals are formed using a partial etch process.

53. The method of forming an optical coupler of claim 36, further comprising the step of coining a portion of the electrical connectors and attaching an optoelectronic device to a coined portion of the electrical connectors.

54. The method of forming an optical coupler of claim 36, further comprising the step of creating protrusions on a bottom surface of the electrical connectors, the protrusions configured to facilitate bonding of a microelectronic device to a substrate.

55. An optical transceiver comprising:  
an electrical connector;  
an optoelectronic component flip-chip mounted attached to a first portion of the  
5 electrical connector;  
a microelectronic device attached to a second portion of the electrical connector;  
an optical transmission medium made of fiber bundles disposed proximate the  
electrical connector;  
an encapsulant surrounding at least a portion of the connector and at least a  
10 portion of the transmission medium; and  
a guide groove formed within a portion of the encapsulant.

56. An optical transceiver comprising:  
an electrical connector;  
an optoelectronic component flip-chip mounted to the electrical connector;  
a microelectronic device coupled to the electrical connector;  
a transmission medium disposed proximate the electrical connector, the  
transmission medium comprising relay lens elements and anti-reflection coating;  
an encapsulant surrounding at least a portion of the connector and at least a  
20 portion of the microelectronic device; and  
a guide groove formed within the encapsulant.

57. An optical system comprising:  
an electrical connector;  
25 an optoelectronic device flip-chip mounted to a first portion of the electrical  
connector;  
a microelectronic device electrically coupled to the electrical connector;  
a transmission medium transparent in the visible and mid infrared regions of the  
radiation spectrum disposed proximate the electrical connector, the transmission medium  
30 comprising relay lens elements and anti-reflection coating; and

an encapsulant surrounding at least a portion of the connector and at least a portion of the microelectronic device.

58. An optical coupler for wavelength division multiplexing comprising:  
an electrical connector;  
an optoelectronic device flip-chip mounted to the electrical connector;  
a wavelength multiplexed transmission medium disposed proximate the electrical connector, the medium comprising relay lens elements and anti-reflection coating;  
an encapsulant surrounding at least a portion of the connector and at least a portion of the transmission medium; and  
a guide groove formed within the encapsulant..

59. An optical coupler for wavelength division demultiplexing comprising:  
an electrical connector;  
an optoelectronic device flip-chip mounted to the electrical connector;  
a wavelength demultiplexing transmission medium disposed proximate the electrical connector, the medium comprising relay lens elements and anti-reflection coating;  
a microelectronic device coupled to the electrical connector;  
an encapsulant surrounding at least a portion of the connector and at least a portion of the microelectronic device; and  
a guide groove formed within the encapsulant..